

Researchers' mobility and its impact on scientific productivity

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SEEK Conference, ZEW, 26 April 2013

Content

- Job changes in science and individual scientific productivity: A framework for analysis
- The UK (Chem, Phys, Comp Sci and Eng) academic job market.
- Econometric strategy and results
- Future work

Policy action with little evidence base

- Lot's of policy action supporting researchers' mobility but is it really good?
- What is the impact of job changes on the overall productivity of the system (spillover effects)?
- What is the impact of a job change on the short to mid-term productivity of researchers?
- Are there peer effects?

The aim/contribution of the paper

- To provide a framework for the analysis of the impact of job changes on individual productivity of researchers
- Present some evidence on UK academic market
- Develop a first econometric model based on full career information of a sample of UK scientists

Existing evidence

- Foreign born researchers (Stephan and Levin, 2001; Hunter, 2009; Stephan, 2012; Franzoni et al., 2012)
- Postdoc mobility / returnees (Canibano et al., 2008; Zubieta, 2009; Horta, 2009; Franzoni et al., 2012)
- Department effects (Long, 1978 ASR; Alison and Long, 1990, ASR; Oyer, 2008, 2008)
- Inbred scientists (Hargens and Farr, 1973; Horta et al. 2010, MS; Inanc and Tuncer, 2011)

Existing evidence

- A few recent works (e.g. Moser, Voena and Waldinger, 2011; Borjas and Doran, 2012) have investigated researcher mobility using historical data that allowed to consider mobility as an external shock and therefore used a quasi experimental design.
 - However, this kinds of data represent rare historical events that allow for advanced econometric exercises but are of little policy relevance

Job matching

- We use a job matching framework (Jovanovic, 1979; Mortensen, 1986) to frame our question:
 - Job change due to productivity mismatch: potential productivity cannot be realized and therefore an offers for a new job is accepts
- Job changes in academia are affected by traditional factors (wage, search costs, family concerns, etc..) but also/**mainly** by research and reputation considerations

Job matching in academia 1

- If the salary does not vary much, it is the expected better *research and reputation environment (r)* that drives mobility;
- Not all types of mobility have a positive impact on productivity but only mobility to a department of higher quality should be associated with an increase in productivity;

Job matching in academia 2

- ***Mobility/adjustment costs (c)***. Direct instantaneous costs of mobility and deferred cost associated to adjusting to the new working environment and setting up new lab effect negatively productivity. These are usually short term costs.

Hypotheses

- We test the following hypotheses:
 - 1.1 A move to higher quality/reputation institution is associated to increase in productivity; (**WEAK EVIDENCE**)
 - Short term decrease due to adjustment costs (**VERIFIED**)
 - 1.2 A move to a lower quality/reputation institution is associated to lower productivity due to lower resources and adjustment costs; (**VERIFIED**)

Mobility definition

- This first analysis focusses on Inter-institutional “real” labour mobility:
 - Ackers (2005, 2008) discusses different forms of mobility – often conflated in policy and academic circles
 - Change in job from one institution to another
 - Job changes that occur after the researcher received her first “tenured” position after PhD
 - Postdoctoral research stays are not considered

Mobility definition

- Different dimensions of inter-institutional mobility:
 - *Career Mobility*: Job transition to a higher/lower position or to a more/less prestigious university (up- and downwards mobility).
 - *Sector Mobility*: Job transition from academia to industry or vice versa (inter-sector mobility)

Data: Sample Description

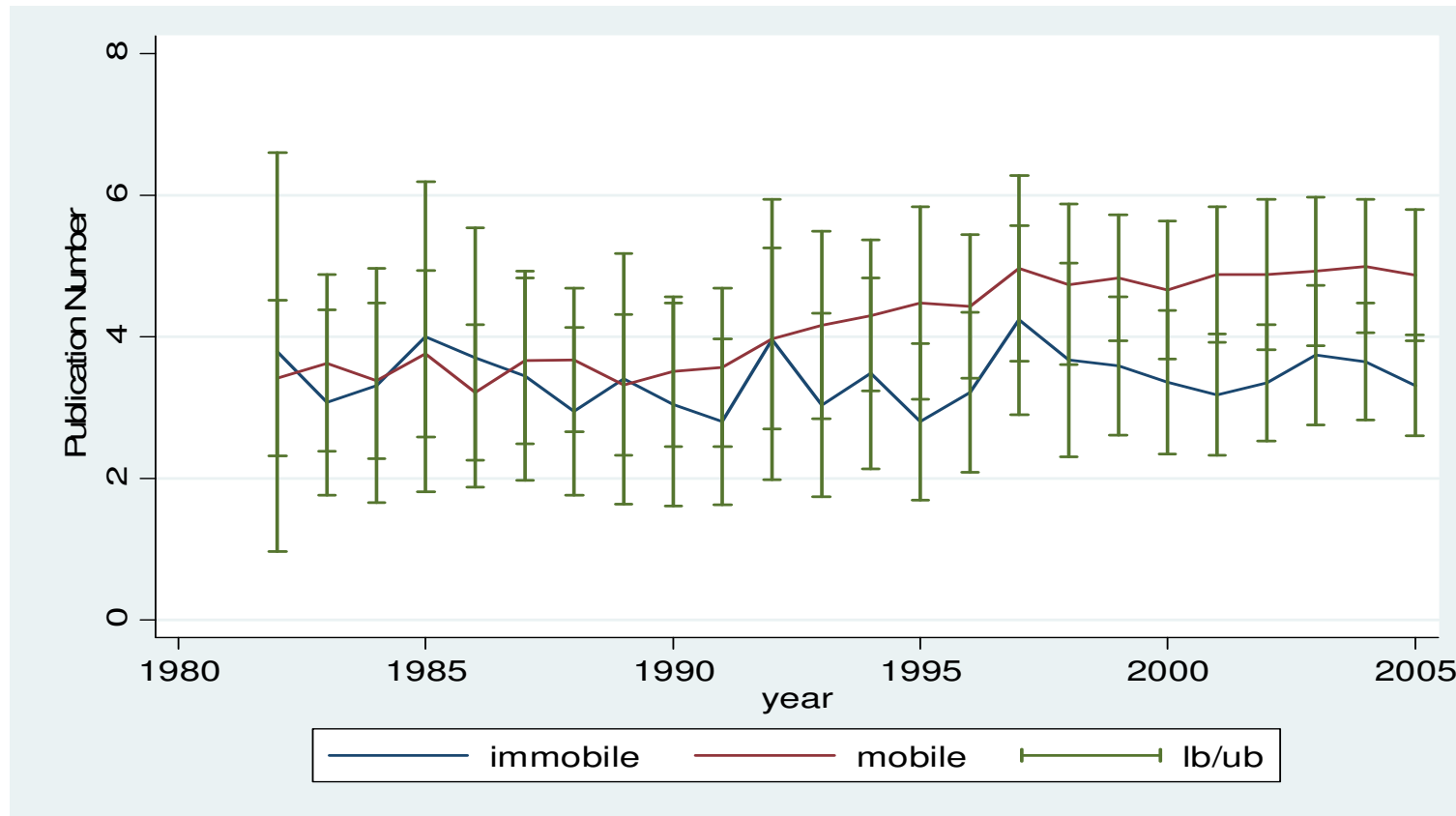
- 170 university researchers working at 45 different UK academic institutions in 2005 and in 4 scientific fields: chemistry, physics, computer sciences and mechanical aeronautical & manufacturing engineering
- Based on a 2004 survey of academic researcher that had been awarded a grant from the Engineering and Physical Sciences Research Council (EPSRC) at least once between 1999 and 2003
- CVs were collected for a sub-sample of survey respondents

Upward and downward

- Quality weighted number of publications (by university and subject area), source Evidence.
- percentile ranks based on the HEIs underlying distribution, reflecting size and quality differences between them
- Upward: move to a department ranking at least 5 percentile points above the prior department in the year preceding the move

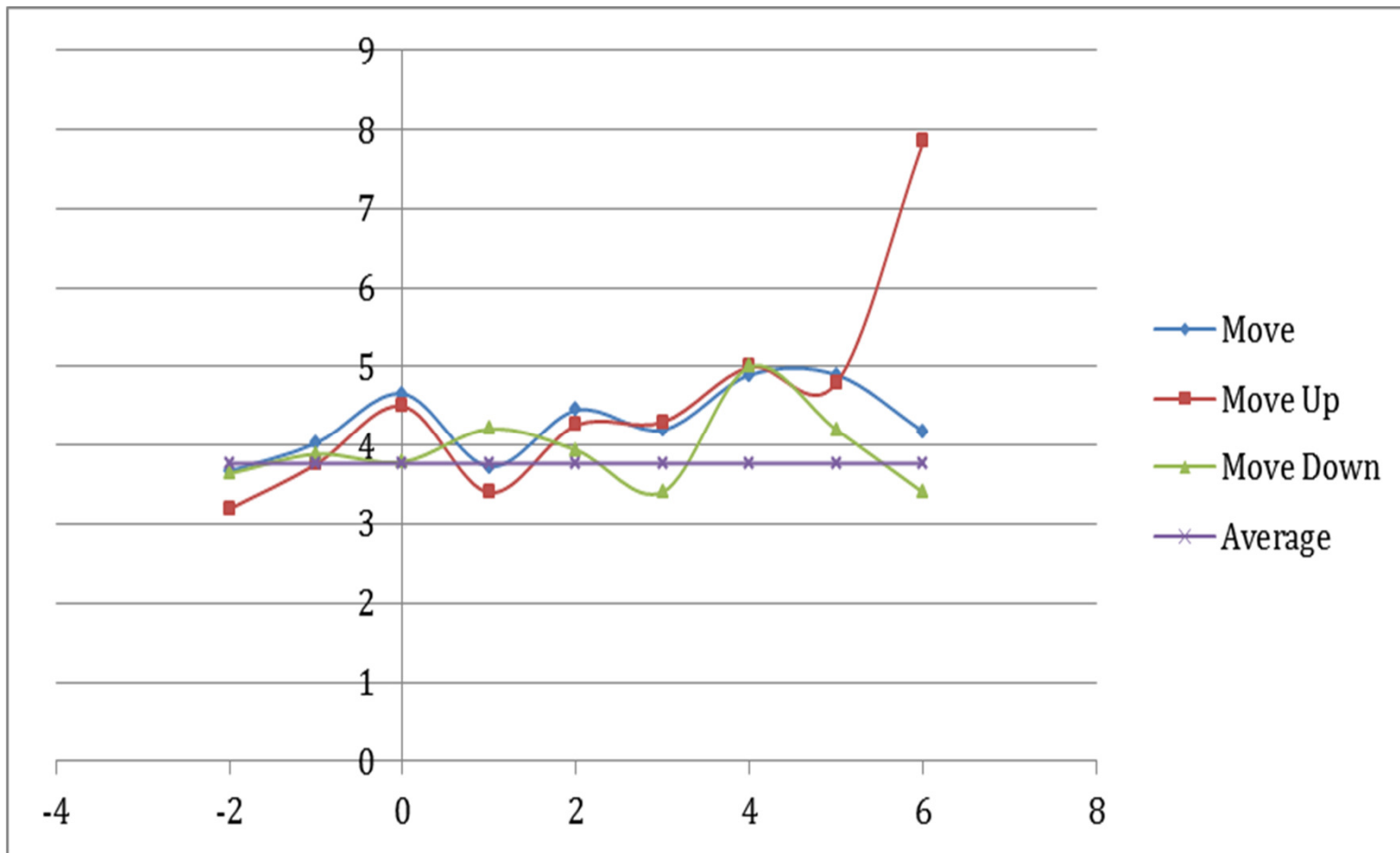
Number of job changes

- 109 (64%) changed job at least once during their career.
- We focus on period 1982-2005 to have sufficient observations in each period.
- Total 159 job changes
 - We focus on 59 job changes between UK institution (82-05)
- Mean number of years on one job 10 years.



- Mean publications Immobile group: 3.529
- Mean publications Mobile group: 4.382
- Diff: $-.853 (.1744)^{***}$

Mobility and productivity



Econometric Specification

Publications are by nature positive and data characterized by overdispersion.

We employ pooled neg-bin model.

Control for unobserved heterogeneity using a pre-sample mean of the dependent variable (Blundell et al. 1995).

$$E(Y_{it}/X_{it}, c_i) = \exp\{\beta X_{it} + c_i\} \quad (1)$$

Y_{it} is the count variable (publications)
 X_{it} explanatory variables including mobility
 c_i individual specific unobserved effect

Econometric Specification

Effect of mobility

- 1) mobility indicator $Mobile_{it}$ that is 1 for mobile researchers
- 2) mobility indicator $Mobile_{it}$ dropping post mobility observations
- 3) mobility shift variable $PostMob_{it}=1$ for all the years following the first move, focussing on mobile researchers
- 4) lags of mobility dummy $Mob_{it}=1$ in year of move, focussing on mobile researchers

Results

VARIABLES	(1) pubno2	(3) pubno2	(5) pubno2	(7) pubno2	(9) pubno2
Mobile _{it}	0.221 (0.136)	0.248 (0.181)			
Postmob _{it}			0.254 (0.170)		
L.Mob _{it}				-0.133 (0.112)	-0.183 (0.111)
L2.Mob _{it}				0.074 (0.105)	0.061 (0.106)
L3. Mob _{it}				-0.009 (0.120)	-0.040 (0.154)
L4. Mob _{it}					0.014 (0.135)
L5. Mob _{it}					0.061 (0.109)
L6. Mob _{it}					0.244** (0.095)
age	0.090* (0.046)	0.145*** (0.041)	0.054 (0.057)	0.010 (0.059)	-0.045 (0.059)
age2	-0.001** (0.001)	-0.002*** (0.000)	-0.000 (0.001)	0.000 (0.001)	0.001 (0.001)
male	-0.364 (0.230)	-0.405** (0.192)	-0.403 (0.402)	-0.327 (0.395)	-0.393 (0.389)
postdoc4	-0.236* (0.133)	-0.127 (0.125)	-0.233 (0.246)	-0.174 (0.247)	-0.096 (0.243)
L.unirank	-0.104 (0.136)	-0.142 (0.150)	-0.024 (0.271)	-0.018 (0.309)	0.188 (0.338)
Pre-observation mean	0.128*** (0.032)	0.154*** (0.031)	-0.051 (0.077)	-0.051 (0.084)	-0.117 (0.100)
Constant	-0.413 (1.090)	-1.412 (1.121)	0.761 (1.387)	1.507 (1.441)	2.490 (1.546)
Year FE	Yes	Yes	Yes		
Subject FE	Yes	Yes	Yes		
Academic Rank FE	Yes	Yes	Yes		
Inalpha	-0.968***	-1.145***	-0.907***	-0.957***	-1.064***
Observations	1,675	1,254	656	585	474
log Likelihood	-4203	-3028	-1660	-1516	-1247
Clusters	112	109	43	43	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1) pubno2	(3) pubno2	(5) pubno2	(7) pubno2	(9) pubno2
Mobile _{it}	0.484*** (0.161)	0.422* (0.233)			
Postmob _{it}			0.127 (0.254)		
L.Mob _{it}				-0.226 (0.246)	-0.058 (0.308)
L2.Mob _{it}				0.042 (0.266)	0.217 (0.335)
L3. Mob _{it}				-0.319* (0.192)	-0.219 (0.296)
L4. Mob _{it}					-0.014 (0.277)
L5. Mob _{it}					0.052 (0.289)
L6. Mob _{it}					0.402* (0.243)
age	0.095** (0.042)	0.121*** (0.038)	0.035 (0.081)	-0.009 (0.083)	-0.191* (0.103)
age2	-0.001** (0.000)	-0.001*** (0.000)	-0.000 (0.001)	0.000 (0.001)	0.002** (0.001)
male	-0.397* (0.205)	-0.306* (0.165)	-1.178 (0.935)	-1.064 (1.122)	-0.833 (1.441)
postdoc	-0.207* (0.120)	-0.128 (0.116)	-0.221 (0.497)	-0.142 (0.619)	-0.136 (0.848)
L.unirank	-0.103 (0.126)	-0.097 (0.142)	-0.192 (0.917)	-0.091 (1.060)	-0.203 (1.312)
Pre-observation mean	0.138*** (0.031)	0.146*** (0.031)	0.008 (0.149)	-0.061 (0.161)	-0.173 (0.192)
Constant	-0.436 (1.024)	-1.053 (0.974)	1.382 (2.168)	2.276 (2.241)	7.127*** (2.415)
Year FE	Yes	Yes	Yes		
Subject FE	Yes	Yes	Yes		
Academic Rank FE	Yes	Yes	Yes		
Inalpha	-1.041***	-1.132***	-1.001***	-1.037***	-1.160***
Observations	1,675	1,516	266	227	173
log Likelihood	-4173	-3695	-720.9	-635.2	-496.6
Clusters	112	112	18	18	16

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Econometric Specification

Literature suggests that more able researchers have many more opportunities to change their jobs.

Thus, endogeneity arises as mobility may be correlated with unobserved individual factors that also affect productivity

- Instrumental variable approach, using distance to home as instrument (Dahl and Sorenson, 2010)
- test for endogeneity based on two-step model approaches described in Wooldridge (2002).

$$Y_{it} = \beta_0 + \beta_1 \widehat{Mob}_{it} + \beta_2 X_{it} + c_i \quad (2)$$

$$\widehat{Mob}_{it} = \hat{\delta}_0 + \hat{\delta}_1 X_{it} + \hat{\theta} distance_{it-1} \quad (3)$$

distance is significant in the first stage regression, but the exogeneity test based on residuals was not rejected. the model does not seem to suffer from endogeneity bias.

Findings Summary

- **Positive effect of upward mobility**
=> move associated to promotion is linked to strong post mobility increase in productivity (with some short term mobility costs)
- **No significant effect for other types of inter-university mobility:** a tendency towards a negative effect for downward mobility
- Mobility from industry to academia has a negative effect that diminishes with time
- Citation counts are not affected by mobility but determined strongly by department prestige

Conclusions and Limitations

- Mobility is not beneficial for researchers per se but the context of the move has to be considered.
- Results country specific? Mobility requirements and opportunities very different in other academic markets
- We look at job changes inside one academic market, results may differ for short-term mobility or international mobility
- The effects may not be strong for the individual but may be for science system as a whole
- Also we may not fully have solve the problem of endogeneity – better instruments need to be found
- Very small sample of research grant awardees that may distort our results